Differences between precipitation estimates from Ku and GMI in first year - Perspective from precipitation features

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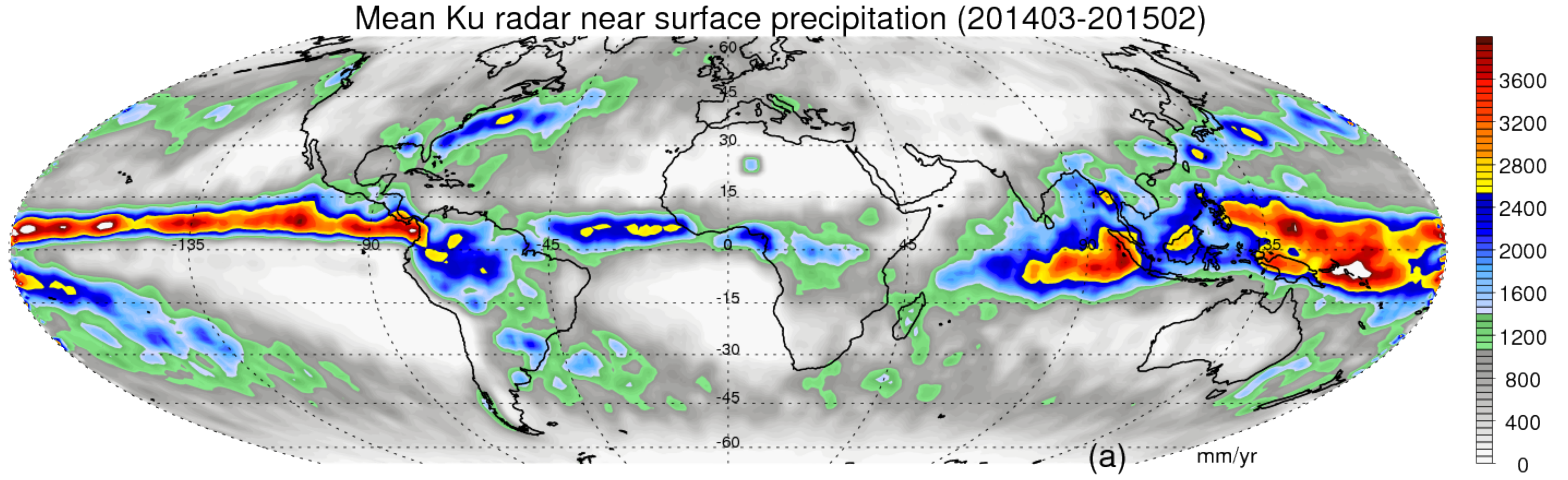
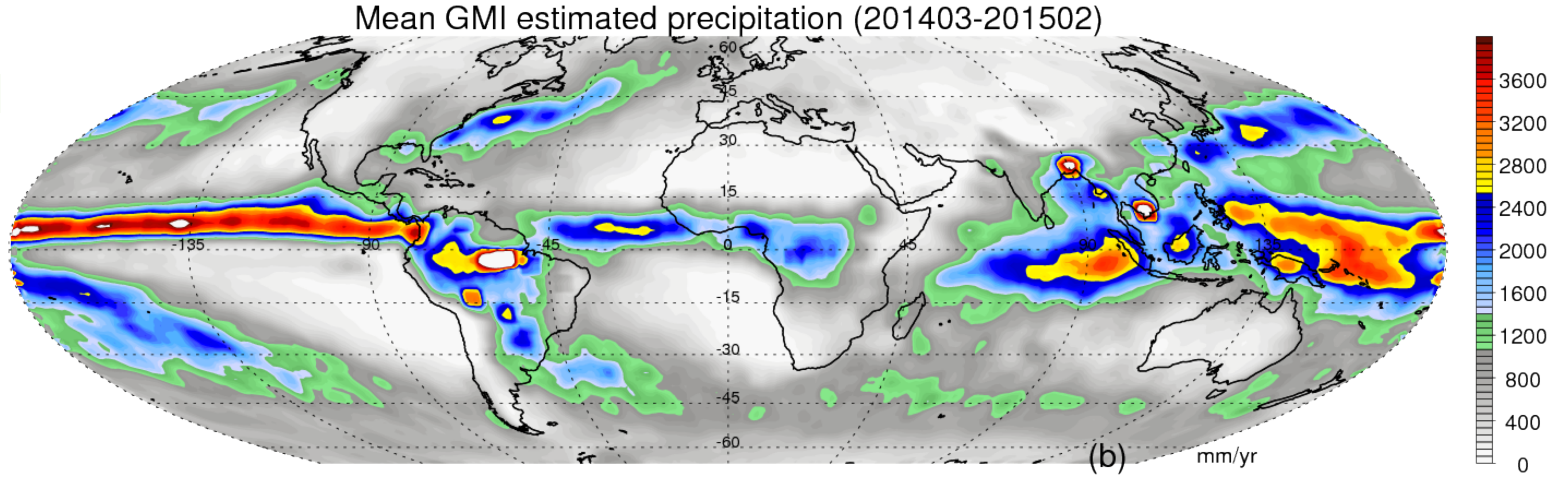
Objectives

- Demonstrate the differences/similarities of the precipitation estimates from the GPM Ku and GMI during the first year (March 2014 – February 2015).
- Understand the differences among the precipitation estimates from the perspective of the precipitation features.

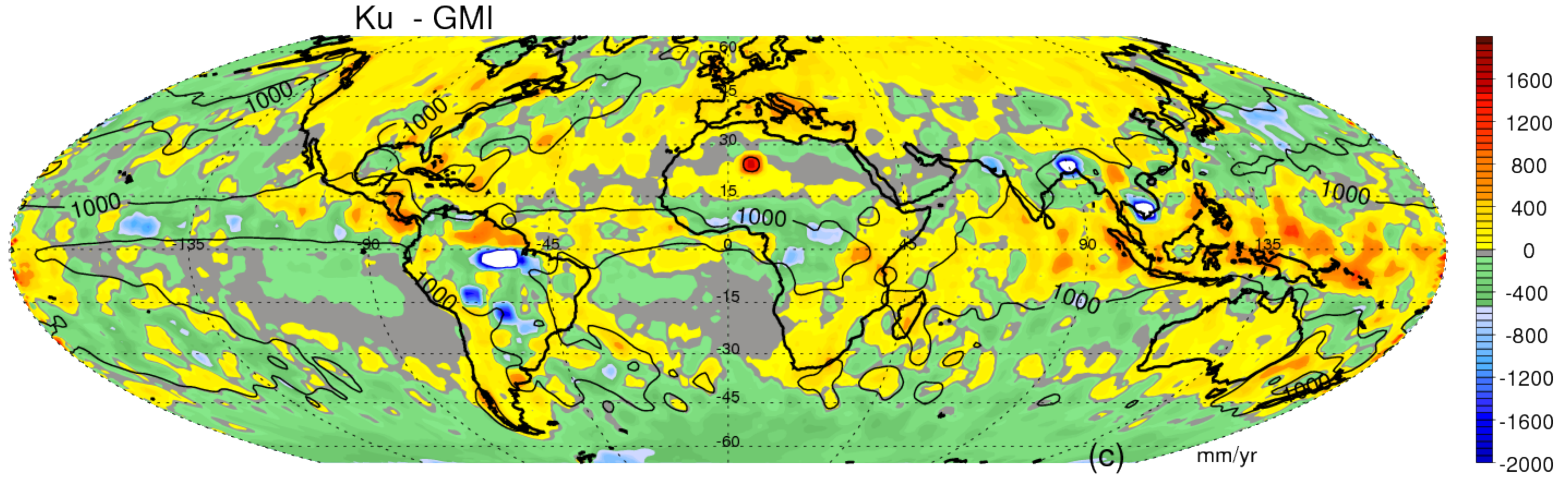
Mean Ku radar near surface precipitation (201403-201502)



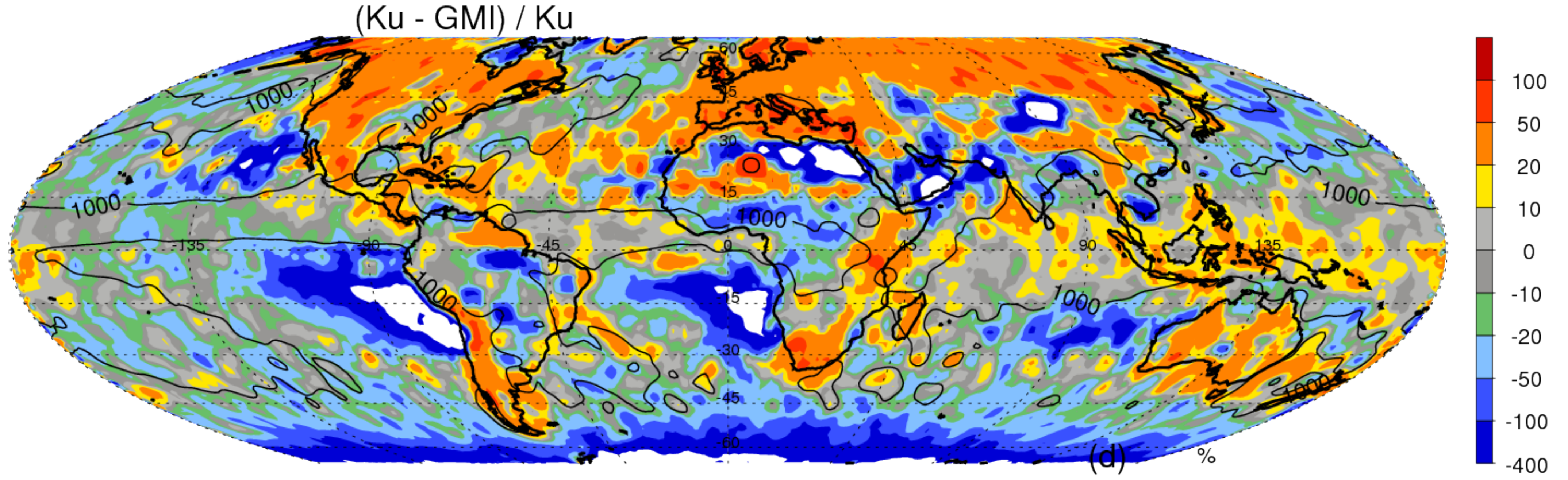
Mean GMI estimated precipitation (201403-201502)



Ku - GMI



(Ku - GMI) / Ku

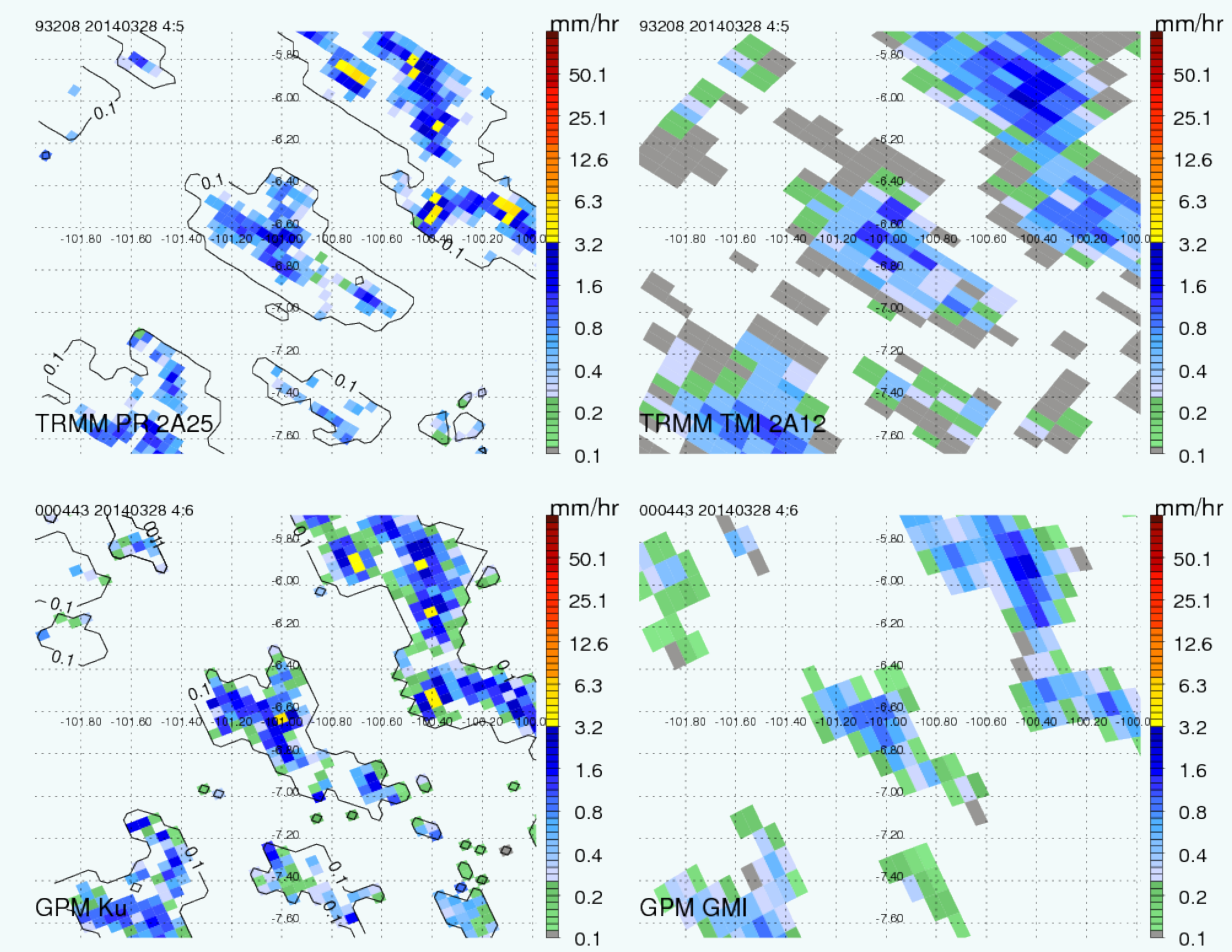


Differences are calculated after degrading level-3 products to 4°x4°

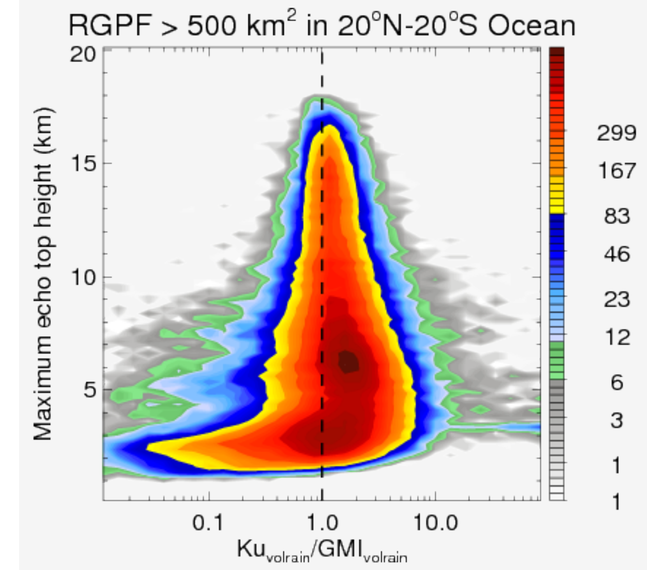
- GMI underestimate precipitation over the mid-high latitude land
- GMI shows abnormally high precipitation over Amazon river and Bay of Bengal.
- GMI over ocean is close to Ku, except > 20% underestimate over the tropical west Pacific, Indian ocean and south oceans, and > 20% overestimate over the east Pacific ITCZ and Northwest Pacific to the east of Japan.

Definition of precipitation features

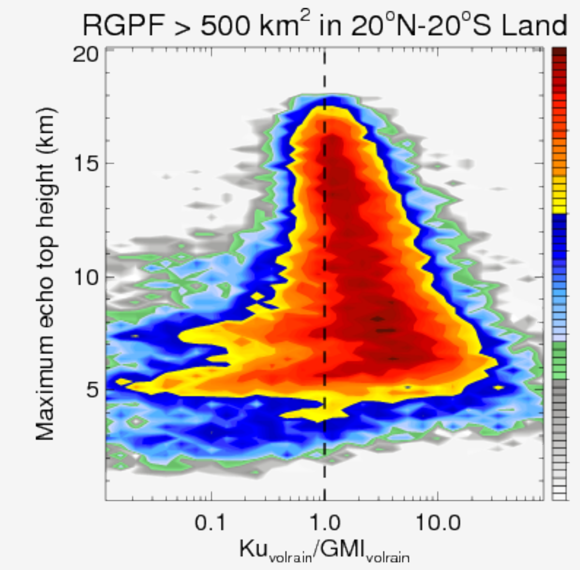
- Level-1: GPM Ku, Ka, GMI low and high frequency pixels are collocated separately. The parallax correction is made for pixels with echo top height > 5 km and path integrate attenuation > 0.4 dBZ.
- Level-2: Precipitation features are defined several different ways. This study used the definition of grouping the contiguous pixels with either Ku and GMI precipitation rate > 0.1 mm/hr. The precipitation volume are summarized inside each radar and GMI precipitation features (RGPFs).
- During March-September, there were about 160 coincident precipitation features with size > 1000 km² being observed by both TRMM and GPM within 5 minutes. All coincidences are shown at: http://atmos.tamucc.edu/trmm/gpm_coincidence/
- Right figure shows the precipitation retrievals from TRMM PR, TMI, and GPM Ku and GMI for one coincident TRMM and GPM case. The contours shows the area of the RGPFs (Bottom left panel for GPM) and RTPF (top left panel for TRMM).



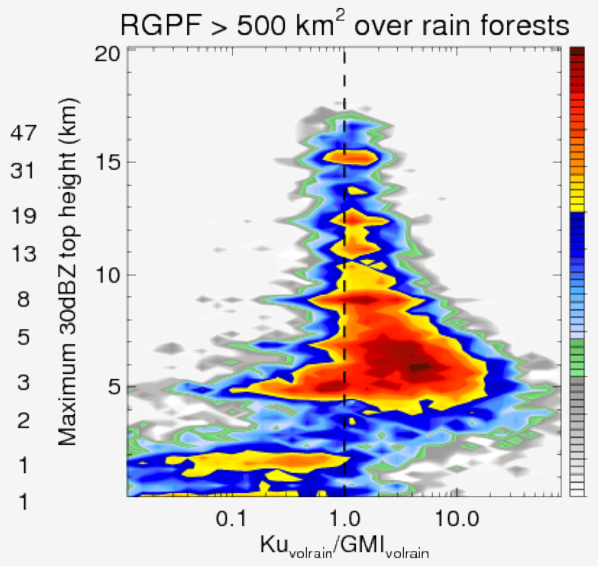
RGPF > 500 km² in 20°N-20°S Ocean



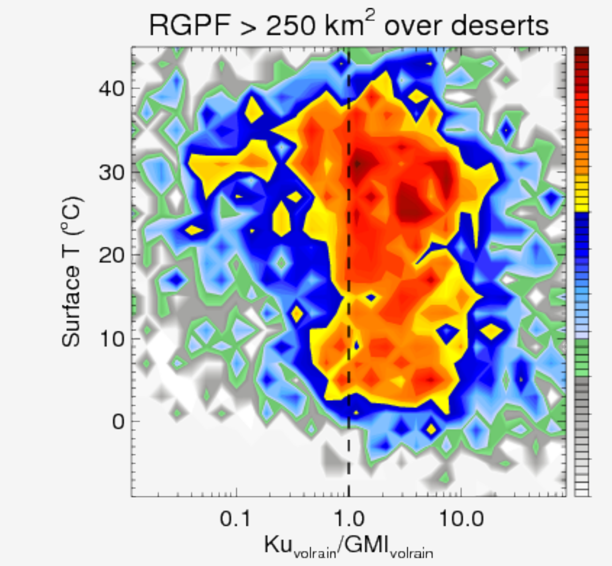
RGPF > 500 km² in 20°N-20°S Land



RGPF > 500 km² over rain forests

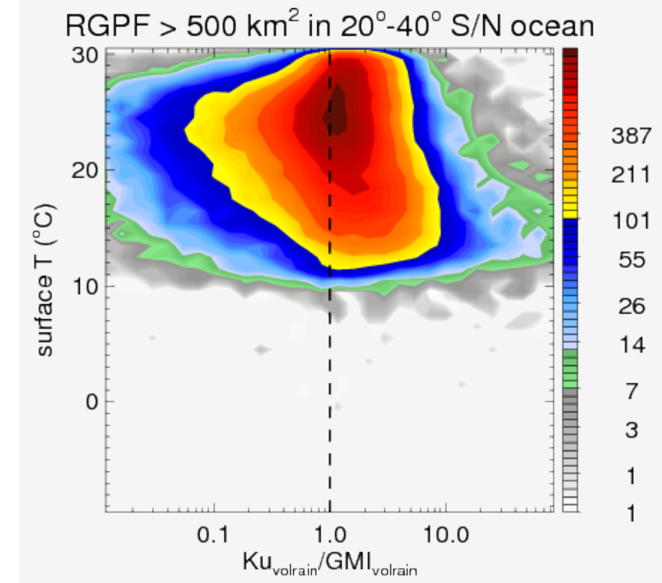


RGPF > 250 km² over deserts

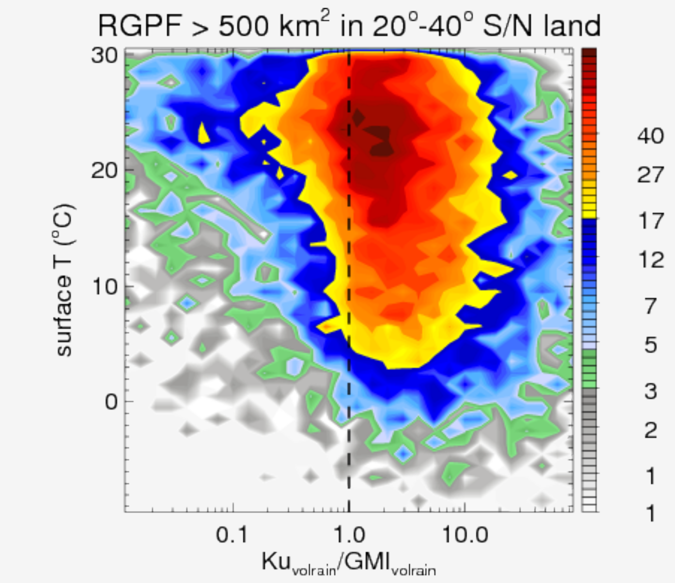


- The new land GPROF from GMI tends to underestimate the precipitation than Ku radar in small and median size systems with echo top below 10 km, and overestimate in some warm rain cases. There is a large improvement over desert regions.

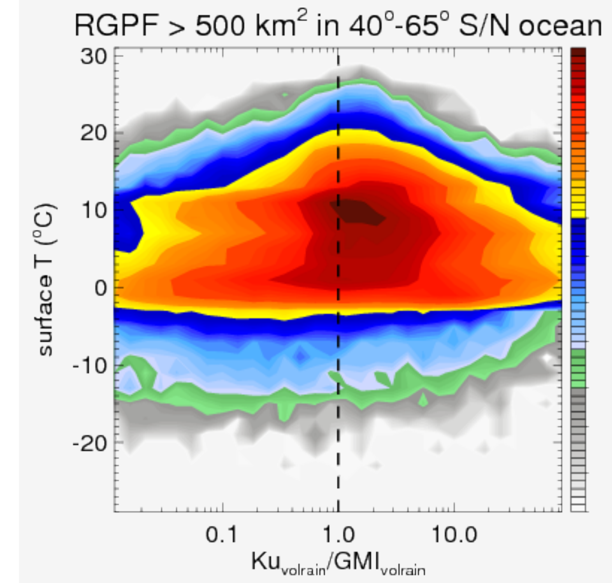
RGPF > 500 km² in 20°-40° S/N ocean



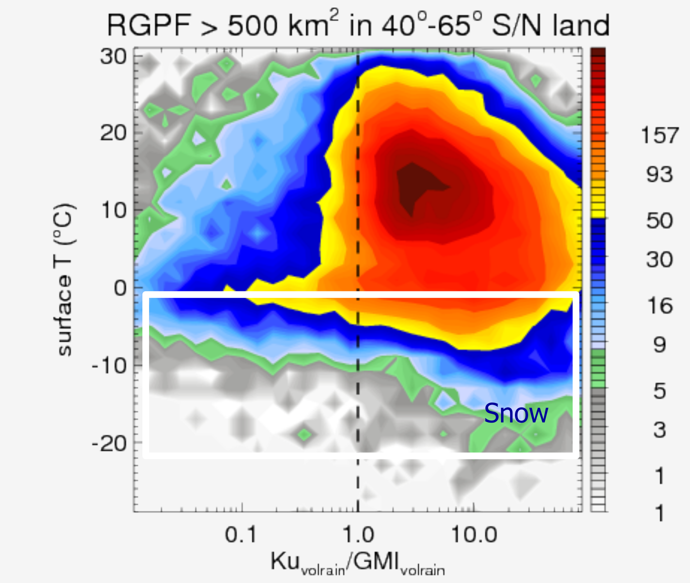
RGPF > 500 km² in 20°-40° S/N land



RGPF > 500 km² in 40°-65° S/N ocean



RGPF > 500 km² in 40°-65° S/N land



- Mid-High latitude land

In both winter and summer, GMI underestimate the precipitation than Ku radar. Winter snow is still a challenge for GMI.

- Mid-High latitude ocean

GMI and Ku precipitation estimates are more consistent in summer than in winter. There are large discrepancy in both directions in winter over ocean.

Summary

- The GPM precipitation feature algorithm has been developed and used to examine the difference among the precipitation products.
- Due to insufficient high latitude cases in the priory database, GMI land algorithm underestimate precipitation than radar at high latitudes.
- There are some abnormally high GMI precipitation rate over several tropical regions (Amazon and Bay of Bengal).
- The next step is to examine the properties of the systems that having large discrepancies between Ku and GMI.

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